

Designing a “Near-Death Experience” Reality Testing System

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Abstract

“Near-death experiences (NDEs)” are usually depicted with a vivid perception of departure from the physical body and being in a distinctive spatial and temporal area setting. There are challenges to whether consciousness during this phenomenon is cerebral or extracerebral? To investigate this subject further, the AWARE research projects were designed. It was a research milestone in this field. During the AWARE projects, images were put in the cardio pulmonary resuscitation (CPR) area. The person with experience of leaving the body was then asked about the nature of the images. In a recent project, a complementary system was designed that contains two main parts: a transmitter connected to the electroshock (as starter) and a receiver connected to the monitor. The laboratory experiment showed that the connection between the parts of the system was systematically and meticulously organized. This new system, such as the AWARE projects, is based on the perception of the visual and auditory elements, during the out-of-body experience component of the NDE but, unlike the AWAREs, it has three main differences in testing of visual elements: unfixed/dynamic images, “timed” movie’s capacity, and the automatic activation. Also this system, records the ambient sounds. So, after the successful resuscitation, researchers will be asked about the ambient sounds specification. The new system records the ambient sounds. Consequently, it becomes feasible to study environmental and corporeal events in more detail, during the phenomenon.

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INTRODUCTION

“Near-death experience” is one of the sheerest examples of facing death that transpires for people who are on the brink of death and have returned to life.^[1]

These encounters are usually depicted with a vivid perception of departure from the physical body and being in a distinctive spatial and temporal area.^[2]

In terms of prevalence, according to research, the pervasiveness of this phenomenon in patients who have sustained a cardiac arrest is 3.6%–23%.^[3-5]

So far, many explanations have been given for these phenomena. In a generic category, two types of physical (cerebral) and metaphysical (extracerebral) explanations of this phenomenon are offered. The most important physicalistic explanations offered are physiological explanations and psychological explanations.^[6,7]

One of the primary reasons given by proponents of physiological perspectives is the possibility of hallucination by hallucinogenic drugs, such as ketamine.^[6,8]

In contrast to these different physiological reasons, some researchers in this area conclude that in such a situation, due to the extreme reduction in brain activity and loss of awareness, it is practically unmanageable to have cognitive and perceptual experiences.^[8-10]

Hence, it appears that researchers need to design a system to help identifying nature of this vague phenomenon.

Thus, it is necessary to concentrate on the specific (provable) elements such as out-of-body experience (OBE).^[6] It is worth mentioning that near-death experience (NDEs) often entails the OBE.^[11,12]

During OBE, the person “seems to be awake and sees his body and the world from a disembodied location outside his physical body.”^[13]

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The most notable research project in this field is the AWARE dual projects that have been carried out by Parnia *et al.* Their projects were based on the perception of the visual and auditory elements, during the OBE component of the NDE.^[14-16]

In the design of AWARE1, in five hospitals, >1000 shelves were placed where the phenomenon was likely to occur. One could only see the elements and images behind shelves from the above viewpoint! Fundamentally, if the claim of the near-death experiencers were an illusion or a physiological process of the brain, they could not have reported anything.

In the end, only one of the nine experiencers “accurately described people, sounds and activities from his resuscitation.” None of the experimenters were resuscitated at the chosen positions.^[14]

In the AWARE II study, an effort was made to modernize the previous research. Through CPR, the visual stimulus was applied using an iPad, whereas the auditory stimulus was applied using headphones.

Besides, cerebral oxygen was measured (cerebral oximetry), and portable electroencephalography (EEG) was used to capture cerebral activity.^[15]

According to the initial results of this study, throughout this experiment, only one person “correctly recalled the audio stimuli given during CPR, but none identified the visual test.”^[16]

Based on these two prominent scientific studies, which are a milestone in identifying the mind-brain or consciousness-brain relationship, more research can be designed and executed.

Hence, an electro-optical system (instrument) was designed and tested to be used in researches such as AWAREs.

MATERIALS AND METHODS

Design the system

This system comprises a transmitter and a receiver. The transmitter is placed next to the electroshock (defibrillator) device and serves as a starter, and the receiver is connected to a display screen (motion picture playback monitor) installed on the wall.

The screen is facing upward (toward the ceiling) and such as the AWARE II project, only by looking at the screen from above, one can see the images on the screen.

The principal part of the transmitter is an activating chip that is in a box that attaches to the body of the defibrillator device but does not interfere in the defibrillator activity.

Instead, only the interface cable - at the end of which is the electronic eye - comes out and surrounds the cable connected to the electroshock pedal [Figure 1].

Once the defibrillator pedal is eliminated throughout CPR, a connection is established between the optical transmitter and receiver part, and the main transmitter of the system will activate.

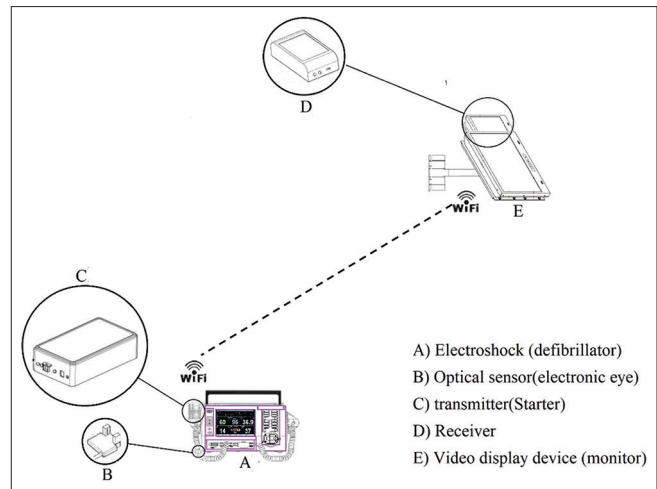


Figure 1: The connection of the components of the system (include the transmitter with the electronic eye and the receiver with the monitor)

When the main transmitter is activated, two operations start:

- A. The sound recording circuit within the receiver starts to record ambient sounds
- B. A communication signal is transmitted to the main receiver to activate the receiver connected to the display.

The chief receiver circuit is an Arduino-supported electronic board and is powered by the monitor connection (by a 5V power supply circuit). The receiver comprises a radio receiver-transmitter, central memory, SD card, and clock module. Once the receiver is activated, two operations start:

- A. The process of playing a motion picture, movie begins automatically
- B. Output goes to the relay planted in the receiver box and activates it.

Researchers' chosen video has already been saved in the receiver's memory circuit and can be played by coded programming.

Furthermore, the relay functions as an activation key, so that researchers can set up a camcorder if they need to record the scene in supplementary tests (for example, to appraise the matching of experiencer's statements with changes in the scene during the experience) (The system was only tested for relay testing, but it was not equipped with a camera).

The transmitter also saves the video during the time interval in the SD card (The system has the capacity to record time during movie playback (in txt format) for ending comparison, but we did not use it in this primary design). Furthermore, ambient sounds (recorded by the transmitter itself) are automatically saved inside the SD card with the given start and end time.

By using of the SD card converter, a researcher can transport the output data from SD card to the supporter computer through a USB port.

Both the transmitter and receiver chips are from the Arduino family. SI4432 is a module that generates the radio frequency data transmission between the transmitter and receiver.

The required codes for this two-way connection are coded. The receiver–transmitter communication is set at 443 MHz radiofrequency.

The connection of the chief components of this system is displayed in the block Flowchart 1.

At the end of a successful resuscitation, if the person has a NDE, the comparison degree of the experiencers, claims with the evidences (monitor images-ambient recorded sounds), will be considered.

If the subject's experience is merely a brain process, he will not be able to represent the broadcast image. However, ambient sound can presently be commented on with assurance.

To complement the clinical trial, the image of the electrocardiogram (EKG), EEG, and pulse oximetry diagram of experiencer, which was obtained concurrently, can be matched with the time of the images and audio recording. In this way, it is possible to determine which stage of the patient's heart or brain arrhythmia/change or pulse oximetry chart's change, was associated with the patient's possible descriptions.

The EKG can be obtained from the defibrillator device. Furthermore, the part that was related to the period of the experience can be examined in terms of the presence of the relevant arrhythmia (at that time).

In some cardiac arrhythmias, the blood flow decreases and it can be an indirect symptom of brain activity.

EEG is seldom employed in critical conditions such as CPR. Nonetheless, it can be compared provided that there is a condition where the EEG is available.

Pulse oximetry chart shows the volume of oxygen in the blood, and regularly an estimation of cerebral blood oxygen.

The pulse oximetry, EEG, and EKG data are used as the source of data for more complex research.

Test and technical results

If the system's settings are correct, its output will be as shown in the right (main) pathway of the diagram [Flowchart 1].

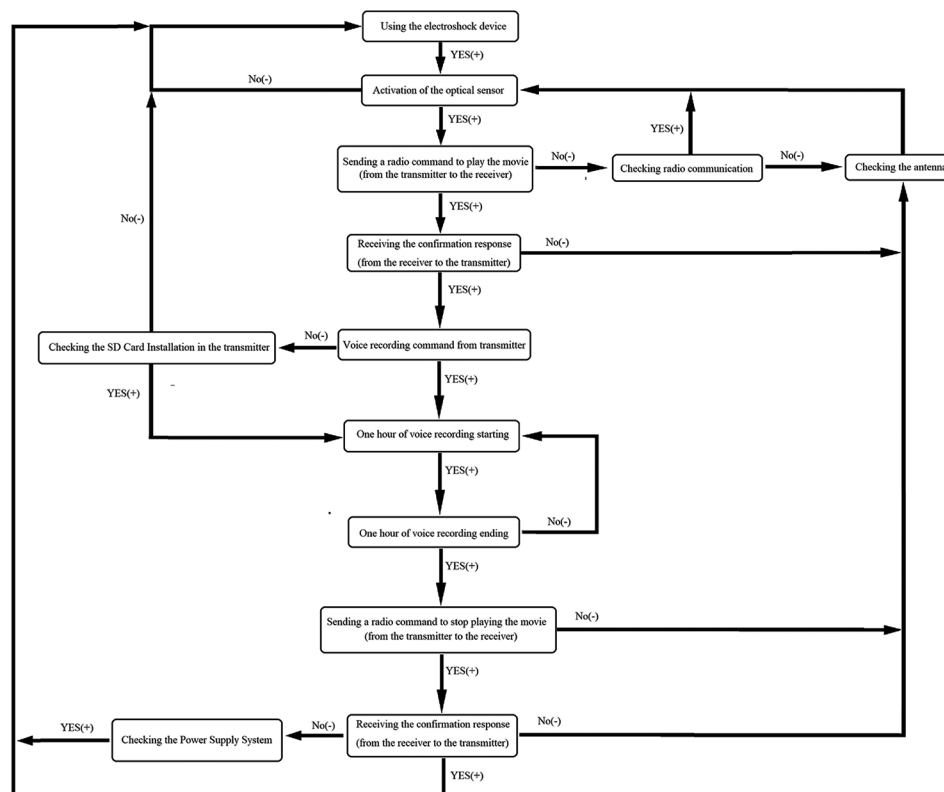
The device was examined in a laboratory setting and involved as below:

- A. After the optical sensor activation, the transmitter's light-emitting diode (LED) indicator and then the receiver's LED Indicator were activated

Precisely in 1 h, the process of film playing and audio recording finished. The saved audio file was transferable by SD card.

It means that the regulated parts of the system were activated in a “domino-like” form, based on the main path of algorithm (coded programming) according to block Flowchart 1.

In other words, by starter activation,(after excluding the laboratory simulated pedal's cable of the defibrillator), the LED



Flowchart 1: The performance sequence of the near-death experience reality testing system

on the transmitter box turned on. Then, the receiver green LED indicator turned on (it determined that the radio communication was set between the transmitter and the receiver), and then the sound recording LED indicator turned on, on the transmitter box. At the end of the process, the device automatically played the video on the receiver's monitor. (The output of the film in this experiment was six images of traffic signs in the archive. Every 10 min, one of them was played from the screen. Furthermore, a movie [like an animation] can further substitute these consecutive images. Of course, the playing time of each frame can be changed according to the researcher's request).

In addition, the test showed that, despite the return of the defibrillator pedal's cable (between the tiny transmitter and tiny receiver of the electronic eyes), the process of activating the device was not stopped during 1 h.

Hence, the system performance came to an end without any problem and also, the system's testing was repeatable.

B. The systems' data (including "pre-recorded video" and "recorded audio" as outputs) could be transferred and exported to the backup computer, by SD card. In the backup computer, media player software, showed that, these outputs had acceptable quality (video and recorded sound resolution during recording length).

C. It was feasible to adjust the system's output to the basic data (hypothetical pulse oximetry, EEG, EKG) in media player software on the backup computer [Figure 2].

DISCUSSION

This new system, such as the AWAREs projects, is based on the perception of the visual and auditory elements, during the OBE component of the NDE but, unlike the AWAREs, it has three main differences in testing of visual elements: unfixed/dynamic images, "timed" movie's capacity, and the automatic activation.

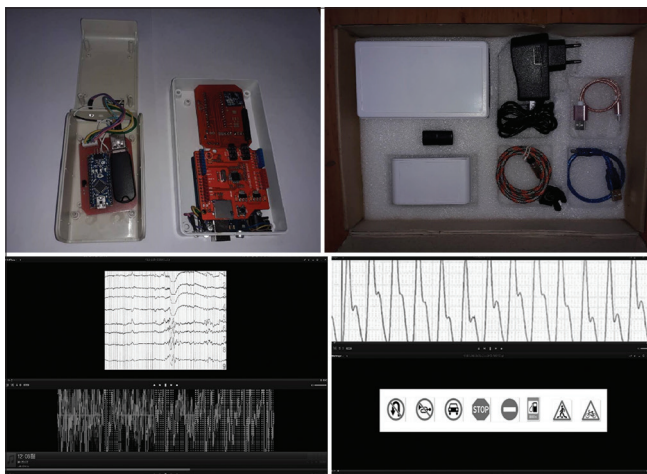


Figure 2: (Up) prototype of near-death experience reality testing system (excluding the monitor) and (Down) hypothetical basic data in media player software

The most notable feature of this system is that it is not a mere display (like an iPad). Rather, it connects to a receiver box that performs the task of playing movies or motion pictures, with capacity of time recording.

In fact, "Timed movie" substitutes the representation of a static image. Consequently, it becomes feasible to study environmental and corporeal events in more detail, in the period of the NDEs (for example, remarking the film frame at the time of "OBE" feeling and comparing it with EEG or EKG changes at that time).

Another point of this system is that it does not intervene in the therapeutic process in the clinical environment (because of automatic activation).

During the AWARE II study, the sound signals transmitted directly to the person's ear by their hearing device, in CPR procedure. If the CPR was successful, then asked the person about the specification of the sound.^[15]

The new system records the ambient sounds. After the successful CPR, researchers will be asked about the ambient sounds specification.^[21] The new system records the ambient sounds.

It is worth remarking that the discussion of implication, the etiology, and the notion of NDE in relation to "mind-brain" relationship has been drawing attention, in recent years of researches.^[17,18] Hence, designing such systems, like this can facilitate the researches.

CONCLUSION

It seems that the AWARE studies are excellent in terms of design, expanse, and importance, and are a turning point in the NDE research domain.

This new complementary system, such as the AWAREs project, is based on the provable elements. Accordingly, it can be employed as a follow-up of the AWAREs project or related and complementary studies. Probably, the main advantage of this system is the opportunity of testing the NDE experiences in the temporal context.

However, whether the NDE phenomenon is supernatural or the illusions of a dying mind, their existence is important and can help understanding the deeper concept of life and death through further research.

The more reliable recognition of this phenomenon is expected to help making ethical decisions in medicine, in end-of-life dilemmatic situations, such as "futile treatment."

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Conflicts of interest

There are no conflicts of interest.

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